

Course Title: Compilers and Languages
Date: 28.11.2015 (First term)Course Code: CCE3113 3rd year
Allowed time: 1 hrs**Answer the following questions:****Question No. 1****(6 marks)****1. Given the following ambiguous context free grammar**

$$S \rightarrow aSbS \mid aS \mid c$$

- (a) Show that the string $s = aacbc$ has two leftmost derivations.
- (b) Show the two derivation trees for the string s .
- (c) Find an equivalent unambiguous context-free grammar.
- (d) Give the unique leftmost derivation and derivation tree for the string s generated from your rewritten unambiguous grammar.

2. Consider the following grammar with terminals $T = \{a, b\}$.

$$S \rightarrow Sa \mid b$$

- (a) Can this grammar be recognized by a recursive descent parser? Why or why not?
- (b) If not, How can you rewrite this grammar to make it a recursive descent grammar?

Question No. 2**(5 marks)****1. Draw a NFA for the regular expression**

$$((b|a)^+c)^+$$

2. C integer literals are formed in the following way:

- Octal literals consist of a leading 0 followed by zero or more octal digits (0 through 7)
- Hexadecimal literals consist of a leading 0 followed by x or X followed by one or more hexadecimal digits ((0 through 9, a through f, or A through F)
- Decimal literals consist of one non-zero decimal digit (1 through 9) followed by zero or more decimal digits (0 through 9).

- (a) Give a regular expression for C integer literals.
- (b) Draw the state diagram of a DFA (**not an NFA!**) for this literal form.

Question No. 3**(9 marks)****True or False? Each of these True/False questions is worth 1 points.**

- 1. Lexical analysis is recursive in order to handle nested parentheses.
- 2. Scanners don't know anything about the grammar of a language.
- 3. A successful parse means the input is semantically correct.
- 4. Finite State Machines can have an unlimited number of states.
- 5. A regular expression is a type of pattern used to classify lexemes.
- 6. You can change state in a DFA without reading any input character.
- 7. Regular expressions cannot be used to match strings of balanced parentheses.
- 8. All Finite State Machines can have only one edge leaving the same state labeled with the same label (character).
- 9. A DFA must have exactly one final (accepting) state.

*Best wishes**Dr. Sherin El Gokhy*